REMARKS

Rejections Under 35 U.S.C. §103(a)

Claims 1-19 have been rejected under 35 U.S.C. §103(a) variously as being unpatentable over Oare et al., U.S. 5,871,600 (Oare '600) in view of Wolpers et al., U.S. 5,342,900 (Wolpers '900), and optionally in view of Horpel et al., EP 385,703 (EP '703), and further in view of Saneto et al., U.S. 5,158,627 (Saneto '627). Applicant maintains the traverse of these rejections for the reasons of record in the amendment mailed May 20, 2003. Applicant herewith provides a Declaration from the inventor Georges Marcel Victor Thielen (Thielen Declaration) and adds the following remarks to distinguish the present claims from the cited art, and amends the claims in an effort to put the claims in condition for allowance.

Claim 1 has been amended to recite specific concentration ranges of 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane and sulfur. Claim 2 has been amended to recite a narrowed concentration range of 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane.

In order to clarify the argument presently previously, Applicant further urges that the cited art teaches away from a runflat tire having an insert as recited in the claims, specifically having 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane and 0.5 to 8 phr of sulfur or alternatively 1.5 to 6 phr of sulfur. As noted by the Examiner, both Wolpers '900 and Horpel EP '703 evidence the use of 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane or similar materials in rubber, particularly as an anti-reversion agent. However, in these references sulfur is used either in very small amounts, i.e., from 0.05 to 0.3 phr in Wolpers '900 (column 4, lines 25-39), and not at all in Horpel EP'703 (see the Examples.) By contrast, the present claims recite 0.5 to 8 phr of sulfur, or alternatively 1.5 to 6 phr, along with the 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane. This difference is significant and distinguishes the claims from the prior art. Wolpers '900 teaches that 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane (BDBzTH) is used with sulfur in "very small, almost catalytic amounts" (column 4, lines 16-17) and teaches surprise that even that very small amount of sulfur could be used as "[t]his result was in no way to be expected in view of the known adverse influence of sulphur on the reversion and aging properties of elastomers." (column 4, lines 54-57) Thus, Wolpers '900 and Horpel EP '703 would suggest to one skilled in the art that 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane should be used with little sulfur (less than 0.3 phr) or no sulfur at all.

By contrast, both the present claims recite the use of higher concentrations of sulfur, in a range of 0.5 to 8 phr or alternatively 1.5 to 6 phr. Further, as noted by the Examiner, Oare '600 teaches the use of dithiocarbamates as accelerators in a runflat insert. However, as evidenced by the Thielen Declaration, one skilled in the art would not view these dithiocarbamate accelerators as encompassing 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane.

Referring now to the Thielen Declaration, Applicant urges that Mr. Thielen is certainly one of at least ordinary skill in the art of rubber and rubber compounding (Thielen Declaration, paragraph 1). As one skilled in the art, Mr. Thielen notes that he does not consider 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane to be a dithiocarbamate accelerator as disclosed in Oare '600. As indicated by Mr. Thielen (Thielen Declaration, paragraph 2), typical dithiocarbamate accelerators include metal dithiocarbamates and dithiocarbamate salts, as evidenced by Attachment A from The Vanderbilt Rubber Handbook, Thirteenth Edition, included with this Response. By contrast, as noted by Mr. Thielen (Thielen Declaration, paragraph 4) and by Horpel EP '703 (abstract), 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane and similar compounds include a dithioalkanediyl moiety such as -S-$(CH_2)_6$-S- which forms stable, reversion-resistant sulfur linkages in a vulcanizate. Such chemical functionality is not typical of dithiocarbamate accelerators, as indicated by Mr. Thielen (Thielen Declaration, paragraphs 3, 4 and 5) and as is evidenced by Attachment A. Thus, Applicant urges that even if 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane may be included in a broad chemical class of dithiocarbarmates, due to the dithioalkanediyl moiety it is chemically dissimilar to the narrower class of dithiocarbamate accelerators disclosed in Oare '600 and would, therefore, not be viewed by one skilled in the art as included in the group of dithiocarbamate accelerators of Oare '600.

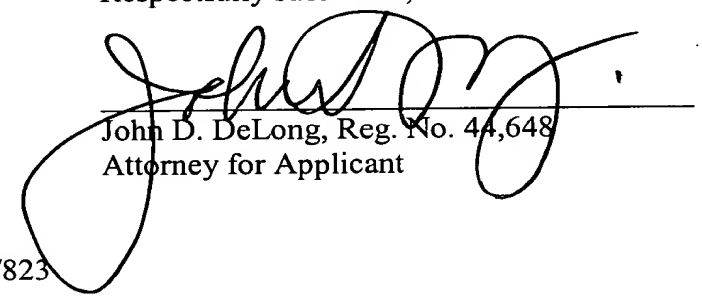
As further evidence that 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane would not be considered to be a dithiocarbamate accelerator by one skill in the art, Applicant refers to the document entitled "Vulcuren Trial Product KA 9188" and disclosed in the Information Disclosure Statement filed with the present application. This document describes 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane as a "crosslinker and anti-reversion agent" (page 1) and makes no reference to 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane as a dithiocarbamate accelerator. The document further supports the function of 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane in forming -S-$(CH_2)_6$-S- stable, reversion-resistant sulfur linkages in a vulcanizate with the -S-$(CH_2)_6$-S- moiety (page 2).

In summary, since Wolpers '900 and Horpel EP '703 teach the use of little or no sulfur with 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane or similar compounds, these references clearly teach away from the use of 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane with high amounts of sulfur in any rubber compound and, therefore, would not motivate one skilled in the art to modify the teaching of Oare '600 to include 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane. Moreover, since one skilled in the art would not consider 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane to be included in the category of dithiocarbamate accelerators as disclosed by Oare '600, Oare '600 would not motivate one skilled in the art to use 1,6-bis(N,N'-dibenzylthiocarbamoyldithio)-hexane in a runflat insert. Applicant asserts that for these reasons, no motivation to combine the references exists, and a prima facie case of obviousness for the current claims has not been made.

Conclusion

It is believed that all of the claims now pending in the subject patent application are allowable, and that it is now appropriate to allow the subject patent application. Such an allowance is accordingly respectfully requested.

Respectfully submitted,



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ATTACHMENT A

THE VANDERBILT RUBBER HANDBOOK

Thirteenth Edition

Edited by Robert F. Ohm

Published by

R. T. Vanderbilt Company, Inc.
INDUSTRIAL MINERALS AND CHEMICALS

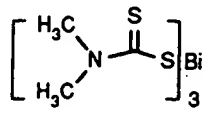
30 Winfield Street, P.O. Box 5150, Norwalk, CT 06856 (203) 853-1400

Price $100.00

Dithiocarbamate Ultra Accelerators

BISMATE

Bismuth
dimethyldithiocarbamate
m.w. 569.66
CAS 21260-46-8



Properties	*Powder*	*Rodform*	*Test Method*
Physical form	powder	rods	
Color	lemon yellow	lemon yellow	
Density, Mg/m^3	2.04 ± 0.03	2.02 (calc.)	T-26-B
Melting Range °C	230 with decomp.	228 with decomp.	T-3-D
Fineness (<100 mesh)	99.9%	–	T-14
Moisture at 100-105°C	1.0% max.	1.0% max.	T-1
Bismuth content	35.0-38.0	32.0-34.0	T-131-A
Solubility	P. insol. in water. Sl. sol. in toluene, carbon disulfide. Sol. in chloroform.		T-153

General Recommendations:

NR, IR, BR, SBR accelerator for high temperature, high speed vulcanization.

Specific Suggestions

		Parts/100 elastomer		
Elastomers	Function	BISMATE	Thiazole or Sulfenamide	Sulfur
NR	Primary accelerator	0.3-1	0.5-1	2-1
IR, BR	Secondary accelerator	0.1-0.3	0.5-1.5	3-1
SBR	Primary accelerator	0.3-1	0.5-1	2-1
	Secondary accelerator	0.1-0.3	1.0-1.5	2.5-1.5

BUTYL EIGHT

Activated dithiocarbamate. A special formulation for accelerating vulcanization at room or slightly elevated temperature

Properties		*Test Method*
Physical form	liquid	
Color	reddish brown	
Density, Mg/m^3	1.01 ± 0.02	T-9-A
Flash point	34°C (94°F)	T-24
Solubility	M. sol. in gasoline. V. sol. in acetone, toluene, chloroform, alcohol, carbon disulfide.	T-153

General Recommendations:

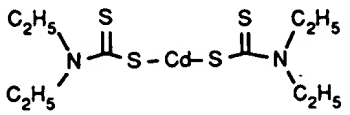
Accelerator for low-temperature vulcanization of spread solvent cements, calendered and extruded stocks. Accelerated stocks should be used within 8-12 hours to prevent precure.

Specific Suggestions

		Parts/100 elastomer		
Elastomers	Function	BUTYL EIGHT	ALTAX	Sulfur
Spreading compounds				
NR, IR	Primary accelerator	4	–	1-2
SBR, NBR	Primary accelerator	6	–	2-3
IIR	Primary accelerator	8	–	2-3
Calendering and Extruding Compounds				
NR, IR	Primary accelerator	3	0.5-1	1-2
SBR, NBR	Primary accelerator	4.5	0.5-1	2-3
IIR	Primary accelerator	6	0.5-1	2-3

ETHYL CADMATE Dustless

Cadmium
diethyldithiocarbamate
m.w. 408.94
CAS 14239-68-0



Properties		*Test Method*
Physical form	granules	
Color	white to lt. gray	
Density, Mg/m	1.39 ± 0.03	T-288
Melting Range °C	65° min.	T-3-D
Moisture at 40-45°C	1.0% max.	T-1
Cadmium content	11.5-12.9%	T-289
Solubility	P. insol. in water, gasoline. M. sol. in toluene, carbon disulfide, chloroform	T-153

General Recommendations:

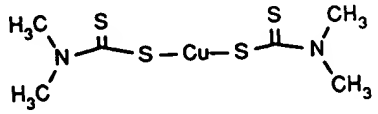
For IIR, EPDM and SBR. Used as a primary accelerator with a thiazole. Gives heat resistant, low compression set properties to NBR and IIR. Used in conjunction with MORFAX in EV curing systems for heat resistance in NR and SBR.

Specific Suggestions

		Parts/100 elastomer		
Elastomers	Function	ETHYL CADMATE	Thiazole	Sulfur
IIR	Primary accelerator	1-4	0-2	2-0.5
EPDM	Primary accelerator, black	1-4	0.5-2	1.75-0.5
	Mineral filled	1-4	0.5-2	4-1
NBR	Primary accelerator	3-4	0.25-0.75	0.75-0.25

METHYL CUMATE

Copper
dimethyldithiocarbamate
m.w. 303.98
CAS 137-29-1



Properties	*Powder*	*Rodform*	*Test Method*
Physical form	powder	rods	
Color	dark brown	dark brown	
Density, Mg/m^3	1.75 ± 0.03	1.74 (calc.)	T-26-B
Melting Range °C	>325	300 min.	T-3-C
Fineness (<100 mesh)	99.9%	–	T-14
Antidusting agent	1.0-3.0%	–	T-46
Moisture at 100-105°C	1.0% max.	1.0% max.	T-1
Copper content	18-20%	17.8-19.0%	T-182-A
Solubility	P. insol. in water, alcohol, gasoline M. sol. in acetone, toluene, chloroform		T-153

General Recommendations:

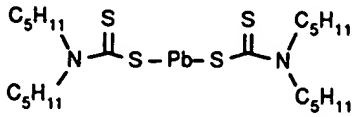
SBR, IIR ultra accelerator for high speed vulcanization. Generally used with thiazole modifier to control scorch rate. Not for use in NR or IR.

Specific Suggestions

		Parts/100 elastomer		
Elastomers	Function	CUMATE	Thiazole or Sulfenamide	Sulfur
SBR	Primary accelerator	0.2-0.75	0.2-1.5	2-0.5
	Secondary accelerator	0.05-0.2	0.5-2	2.5-1.5
IIR	Primary accelerator	1-2	0.5-2	2-1

AMYL LEDATE

Lead
diamyldithiocarbamate
50% in oil
m.w. 672.05
CAS 36501-84-5



Properties		*Test Method*
Physical form	liquid	
Color	lt. amber	
Density, Mg/m^3	1.10 ± 0.02	T-9-A
Moisture at 40-45°C	1.0% max.	T-1-A
Lead content	15.4-16.0%	T-169
Solubility	P. insol. in acetone, v. sol. in toluene, chloroform and petroleum hydrocarbons.	T-153

General Recommendations:

A liquid dithiocarbamate recommended for improved dynamic properties in NR and IR. Used in conjunction with a sulfenamide, OCTOATE Z and BUTYL TUADS in soluble cure systems in black filled NR and IR compounds.

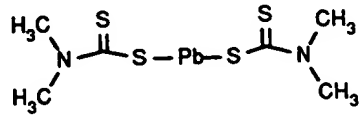
Specific Suggestions

Parts/100 elastomer

Elastomers	Function	AMYL LEDATE	BUTYL TUADS	Sulfenamide	Sulfur
NR	Primary accelerator	0.75-1	0.5-0.65	1.5-1.85	0.6
IR	Primary accelerator	0.75-1	0.5-0.65	1.5-1.85	0.6

METHYL LEDATE

Lead
dimethyldithiocarbamate
m.w. 447.65
CAS 19010-66-3



Properties		*Test Method*
Physical form	granules	
Color	gray	
Density, Mg/m^3	2.43 (calc.)	T-26-B
Melting Range °C	300 min.	T-3-C
Moisture at 100-105°C	1.0% max.	T-1
Lead content	41.0-43.0%	T-22-A
Solubility	P. insol. in all common organic solvents. Sl. sol. in cyclohexanone	T-153

General Recommendations:

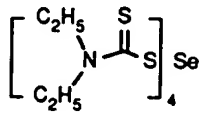
NR, SBR, IIR, IR, BR ultra accelerator for high speed, high temperature vulcanization. Effective under continuous curing conditions. Generally used with thiazole modifiers.

Specific Suggestions

		Parts/100 elastomer		
Elastomers	Function	METHYL LEDATE	Thiazole or Sulfenamide	Sulfur
NR	Primary accelerator	0.3-1	1-0	3-1
	Secondary accelerator	0.1-0.3	1.5-1	3-2
BR, IR	Primary accelerator	0.3-1	1-0	2.75-1.25
	Secondary accelerator	0.1-0.5	1.5-1	2.75-1.25
SBR	Primary accelerator	0.3-1	1-0	2.5-1
	Secondary accelerator	0.1-0.3	1.5-1	2.5-1.5
IIR	Primary accelerator	1-2	2-0.5	2-1

ETHYL SELENAC

Selenium
diethyldithiocarbamate
m.w. 672.00
CAS 21559-14-8



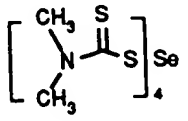
Properties		*Test Method*
Physical form	powder	
Color	yellow	
Density, Mg/m^3	1.32 ± 0.03	T-26-B
Melting Range °C	59-85	T-3-D
Fineness (<100 mesh)	99.5%	T-14
Moisture at 40-45°C	2.5% max.	T-1
Selenium content	10.5-12.7%	T-124-A
Ash	0.5%	T-4
Solubility	P. insol. in water, dil. caustic, gasoline. Sol. in toluene, carbon disulfide, chloroform.	T-153

General Recommendations:

For NR, SBR, IIR. Also vulcanizing agent. Effective in low sulfur and sulfurless heat resistant compounds. Nondiscoloring in light stocks. Generally used with thiazoles to balance scorch and curing characteristics.

Specific Suggestions: See METHYL SELENAC

METHYL SELENAC



Selenium
dimethyldithiocarbamate
m.w. 559.78
CAS 144-34-4

Properties

		Test Method
Physical form	powder	
Color	yellow	
Density, Mg/m^3	1.58 ± 0.03	T-26-B
Melting Range °C	140-172	T-3-D
Fineness (<100 mesh)	99.9%	T-14
Moisture at 80-85°C	1.0% max.	T-1
Selenium content	13.0-15.0%	T-124-A
Ash	0.75% max.	T-4
Solubility	P. insol. in water, dil. caustic, gasoline Sol. in toluene, carbon disulfide, sl. sol. in chloroform	T-153

General Recommendations:

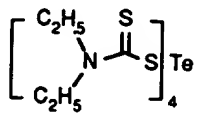
For NR, SBR, IIR. Also vulcanizing agent. Effective in low sulfur and sulfurless heat resistant compounds. Nondiscoloring in light stocks. Generally used with thiazoles to balance scorch and curing characteristics.

Specific Suggestions

		Parts/100 elastomer		
Elastomers	Function	Ethyl or Methyl	Thiazole	Sulfur
NR, BR, IR	Vulcanizing agent	2-4	0-1	0.5-0
	Primary accelerator	0.3-1	0-1	3-0.75
	Secondary accelerator	0.1-0.3	1-1.5	3-2
SBR	Vulcanizing agent	2-4	0-1	0.5-0
	Primary accelerator	0.3-1	0-1	2.5-0.75
	Secondary accelerator	0.1-0.3	1-1.5	2.5-1
IIR	Vulcanizing agent	3-5	0-1	1-0
	Primary accelerator	1-2	0.5-2	2-1

ETHYL TELLURAC

Tellurium
diethyldithiocarbamate
m.w. 720.69
CAS 20941-65-5



Properties	*Powder*	*Rodform*	*Test Method*
Physical form	powder	rods	
Color	orange-yellow	orange-yellow	
Density, Mg/m^3	1.44 ± 0.03	1.40 (calc.)	T-26-B
Melting range °C	108-119	106 min.	T-3-B
Fineness (<30 mesh)	100%	–	T-14
Inert binder	–	19.0-21.0%	–
Moisture at 60-65°C	1.0% max.	1.0% max.	T-1-A
Tellurium content	16.0-18.0%	14.0-16.0%	T-64
Ash	2.5% max.	–	T-4
Solubility	P. insol. in water. Sl. sol. in alcohol, gasoline. Sol. in toluene, carbon disulfide, chloroform.		T-153

General Recommendations:

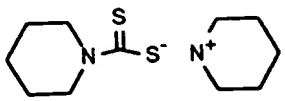
For NR, SBR, NBR, EPDM. Generally used with thiazole modifiers. Produces high modulus vulcanization. Particularly active in IIR compounds.

Specific Suggestions

Elastomers	Function	*Parts/100 elastomer* TELLURAC	Thiazole	Sulfur
NR	Primary accelerator	0.3-1	0-1.5	3-1
	Secondary accelerator	0.3-1	1-1.5	3-1
SBR, NBR	Primary accelerator	0.3-1	0-1.5	2.5-1
	Secondary accelerator	0.1-0.3	1-1.5	2.5-1
EPDM	Primary accelerator	0.5-1.5	0.5-2	5-1.75
Butyl (IIR)	Primary accelerator	1-2	0.5-2	5-2

VANAX 552

Piperidinium
pentamethylene
dithiocarbamate
m.w. 246.47
CAS 98-77-1



Properties		*Test Method*
Physical form	powder	
Color	creamy white to lt. yellow	
Density, Mg/m^3	1.20 ± 0.03	T-288
Melting point °C, initial	163 min.	T-3-E
Ash	0.5% max.	T-4
Water insolubles	1.0% max.	T-878
Solubility	V. sol. in chloroform. M. sol. in acetone, toluene, alcohol. Insol. in hexane, gasoline.	

General Recommendations:

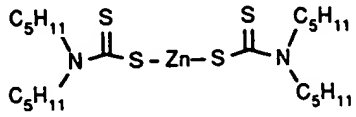
For NR, SR, cements and latexes. Ultra-fase accelerator for low temperature cures. Acts as a chemical peptizer for sulfur-modified G-type neoprenes. Disperses in water for latex compounding.

Specific Suggestions

		Parts/100 elastomer		
Elastomers	Function	VANAX 552	ZETAX	Sulfur
NR	Primary accelerator	0.5-2.0	0	3-1
	Secondary accelerator	0.25	1.5	3-1
SBR	Primary accelerator	0.25-1.0	0	3-1
CR	Peptizer	0.1-2.0	0	3-0

AMYL ZIMATE

Zinc
diamyldithiocarbamate
50% in oil
m.w. 530.22
CAS 15337-18-5



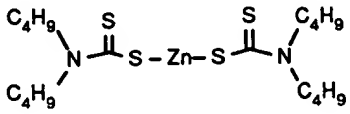
Properties		*Test Method*
Physical form	liquid	
Color	lt. amber	
Density, Mg/m^3	0.99 ± 0.02	T-9-A
Zinc	6.0-6.5%	T-128-C
Solubility	P. insol. in water. V. sol. in acetone, toluene, chloroform and petroleum hydrocarbons.	T-153

General Recommendations:

A liquid dithiocarbamate recommended for improved dynamic properties in natural and synthetic rubbers. Used in conjunction with OCTOATE Z and BUTYL TUADS in soluble cure systems in mineral filled rubber and polyisoprene compounds.

BUTYL ZIMATE

Zinc
di-n-butyldithiocarbamate
m.w. 474.13
CAS 136-23-2



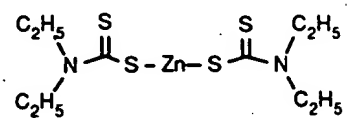
Properties		*Test Method*
Physical form	powder	
Color	white to cream	
Density, Mg/m^3	1.21 ± 0.03	T-288
Melting Range °C	104-112	T-3-D
Fineness (<100 mesh)	99.9%	T-14
Moisture at 60-65°C	1.0% max.	T-1-A
Zinc content	13.0-15.0%	T-365
Solubility	P. insol. in water, dilute caustic. Sol. in toluene, carbon disulfide, chloroform, gasoline.	T-153

General Recommendations:

Accelerator for EPDM and natural and synthetic latexes. Functions as nondiscoloring antioxidant in noncuring applicatons and stabilizer in IIR. Also used as an antioxidant in thermoplastic rubbers and hot melts.

ETHYL ZIMATE

Zinc
diethyldithiocarbamate
m.w. 361.92
CAS 14324-55-1



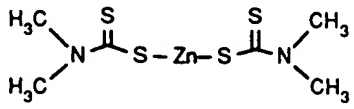
Properties		*Test Method*
Physical form	powder	
Color	white	
Density, Mg/m^3	1.48 ± 0.03	T-288
Melting range°C	171-182.5	T-3-D
Fineness (<100 mesh)	99.9%	T-14
Moisture at 85-90°C	1.0% max.	T-1
Zinc content	17.0-19.5%	T-365
Solubility	P. insol. in water, gasoline. M. sol. in dil. caustic, toluene, carbon disulfide, chloroform.	T-153

General Recommendations:

Used as a primary accelerator in NR and SBR. Generally requires a thiazole modifier for safe processing and wide cure range. Nondiscoloring in light colored stocks. Acts as a stabilizer in thermoplastic rubbers and hot melts.

METHYL ZIMATE

Zinc
dimethyldithiocarbamate
m.w.305.82
CAS 137-30-4



Properties	*Powder*	*RODFORM*	*Test Method*
Physical form	powder	rods	
Color	white	white	
Density, Mg/m^3	1.71 ± 0.03	1.69 (calc.)	T-288
Melting Range °C	242-257	239 min.	T-3-B
Fineness (<100 mesh)	99.9% min.	–	T-14
Antidusting agent	1.0-3.0%	–	T-46
Moisture at 100-105°C	0.5% max.	0.5% max.	T-1
Zinc content	19.5-23.0%	19.0-21.0%	T-365
Solubility	P. insol. in water, gasoline. M. sol. in dil. caustic, toluene, carbon disulfide, chloroform.		T-153

General Recommendations:

For NR and synthetic rubbers. Active over wide temperature range. Generally requires thiazole modifier for safe processing and wide curing range. Nondiscoloring in light stocks.

Specific Suggestions — *Parts/100 elastomer*

Elastomers	Function	METHYL ZIMATE	Thiazole or Sulfenamide	Sulfur
NR, IR, BR	Primary accelerator	0.25-0.75	0.5-1	3-1
	Secondary accelerator	0.25-0.5	1-1.5	3-2
SBR	Primary accelerator	0.03-1	0.5-1	2.5-1
	Secondary accelerator	0.1-0.3	1-1.5	2.5-1.4
IIR	Primary accelerator	1-2	0-2	2-1
	Secondary accelerator	0.5-1	0.5-1	2-1
EPDM	Primary accelerator	1-2	0.5-2	1.75-1.25